#4

SEQUENCE LISTING

<110> Hallahan, David
Keiper-Hrynko, Natalie

<120> Genes Involved in the Biosynthesis of Isopentenyl Diphosphate in Hevea brasiliensis Latex

<130> CL1792 US NA

<150> 60/307,637
<151> 2001-07-25

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<170> Microsoft Office 97

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<213> Hevea brasiliensis

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tctcgactag gacatgatac cattattgat ggcatgctga aagatggcct gtgggatgta 480

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<212> DNA

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tgattggttc ccatgtggga ttgtttagct gtcatagctg taaaatttgc tgttatatga 1920

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<212> DNA

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gctactgctg agaatgatga ttcactgaaa cttcagctca aggatctggc actagaattt 180

tcatggccaa ttggtagaat cagagaggca ttatctaact taggtgctcc ttcctcttca 240

acacgcacct cttgctcgat ggaatcaatt aagacaattt cagctttggt tgaagaagaa 300

aatatcccag aggcaaaaat tgcactcact tctggagtgt cagccttttt atggttatat 360

acttctattc aaggatttaa gcctgccacc gtagttgtca cttctgatct tccactgggt 420

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tcagactctg taaatgtgga cacaaagcac ctagggtggt caatatttgg agagtctgac 540

cttgaattat taaacaaatg ggctctcgaa ggtgaaaaga taattcatgg aaagccatct 600

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actcgcatca agtccaacat gccgctcaaa atgctcgtca ctaacacaag agttgggagg 720

aacacaaaag cactggttgc tggtgtttca gagagaacct tacggcaccc taatgccatg 780

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cctatttacg atgaaatcaa acctgatagt tgggcatggg catggactga tgtgaaatta 180

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<211> 411

<212> PRT

<213> Hevea brasiliensis

<400> 8

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Phe Ser Ala Thr Lys Leu Gly Ser Ile Ala Ile Gln Ala Ala Leu Lys
35 40 45

Arg Ala Asn Val Asp Pro Ser Leu Val Gln Glu Val Phe Phe Gly Asn
50 55 60

Val Leu Ser Ala Asn Leu Gly Gln Ala Pro Ala Arg Gln Ala Ala Leu
65 70 75 80

Gly Ala Gly Ile Pro Asn Ser Val Ile Cys Thr Thr Ile Asn Lys Val
85 90 95

Cys Ala Ser Gly Met Lys Ala Thr Met Leu Ala Ala Leu Thr Ile Gln
100 105 110

Val Gly Ile Asn Asp Ile Val Val Ala Gly Gly Met Glu Ser Met Ser
115 120 125

Asn Ala Pro Lys Tyr Leu Ala Glu Ala Arg Arg Gly Ser Arg Leu Gly
130 135 140

His Asp Thr Ile Ile Asp Gly Met Leu Lys Asp Gly Leu Trp Asp Val
145 150 155 160

Tyr Asn Asp Phe Gly Met Gly Val Cys Ala Glu Ile Cys Ala Asp Gln
165 170 175

His Asn Ile Thr Arg Glu Glu Lys Asp Ser Tyr Ala Ile Arg Ser Phe
180 185 190

Glu Arg Gly Asn Ser Ala Gln Asn Gly Gly Val Phe Ser Trp Glu Ile
195 200 205

Val Pro Val Glu Val Ser Gly Gly Arg Gly Lys Ser Val Met Val Val
210 215 220

Asp Lys Asp Glu Gly Leu Ile Lys Phe Asp Ala Ala Lys Leu Arg Lys
225 230 235 240

Leu Arg Pro Ile Ser Arg Ile Gly Ser Val Thr Ala Gly Asn Ala Ser
245 250 255

Ile Ile Ser Asp Gly Ala Ala Ala Leu Val Leu Val Ser Gly Glu Lys
260 265 270

Ala Ile Glu Leu Gly Leu Gln Val Ile Ala Arg Ile Arg Gly Tyr Gly
275 280 285

Asp Ala Ala Gln Ala Pro Glu Leu Phe Thr Thr Ala Pro Ala Leu Ala
290 295 300

Ile Pro Lys Ala Ile Ser Asn Ala Gly Leu Glu Ala Ser Gln Ile Asp
305 310 315 320

Tyr Tyr Glu Ile Asn Glu Ala Phe Ser Val Val Ala Leu Ala Asn Gln
325 330 335

Lys Ile Leu Gly Leu Asn Pro Glu Lys Leu Asn Val His Gly Gly Ala
340 345 350

Val Ser Leu Gly His Pro Leu Gly Cys Ser Gly Ala Arg Ile Leu Val
355 360 365

Thr Leu Leu Gly Val Leu Arg His Lys Asn Gly Lys Tyr Gly Val Ala
370 375 380

Ser Ile Cys Asn Gly Gly Gly Gly Ala Ser Ala Leu Val Leu Glu Leu
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Met Ser Val Gly Arg Val Gly Arg Ser Leu Leu
405 410

<210> 9

<211> 464

<212> PRT

<213> Hevea brasiliensis

<400> 9

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20 25 30

Gly Lys Tyr Thr Ile Gly Leu Gly Gln Asp Cys Met Ala Phe Cys Thr
35 40 45

Glu Val Glu Asp Val Ile Ser Met Ser Leu Thr Ala Val Thr Ser Leu
50 55 60

Leu Asp Lys Tyr Asn Ile Asp Pro Lys Gln Ile Gly Arg Leu Glu Val
65 70 75 80

Gly Ser Glu Thr Val Ile Asp Lys Ser Lys Ser Ile Lys Thr Phe Leu
85 90 95

Met Gln Ile Phe Glu Lys Phe Gly Asn Thr Asp Ile Glu Gly Val Asp
100 105 110

Ser Thr Asn Ala Cys Tyr Gly Gly Thr Ala Ala Leu Phe Asn Cys Val
115 120 125

Asn Trp Val Glu Ser Ser Ser Trp Asp Gly Arg Tyr Gly Leu Val Val
130 135 140

Cys Thr Asp Ser Ala Val Tyr Ala Glu Gly Pro Ala Arg Pro Thr Gly
145 150 155 160

Gly Ala Ala Ala Ile Ala Ile Leu Val Gly Pro Asp Ala Pro Ile Ala
165 170 175

Phe Glu Ser Lys Phe Arg Gly Ser His Met Ser His Ala Tyr Asp Phe
180 185 190

Tyr Lys Pro Asn Leu Ala Ser Glu Tyr Pro Val Val Asp Gly Lys Leu
195 200 205

Ser Gln Thr Cys Tyr Leu Met Ala Leu Asp Ser Cys Tyr Lys His Phe
210 215 220

Cys Ala Lys Tyr Glu Lys Phe Glu Gly Lys Gln Phe Ser Ile Ser Asp
225 230 235 240

Ala Glu Tyr Phe Val Phe His Ser Pro Tyr Asn Lys Leu Val Gln Lys
245 250 255

Ser Phe Ala Arg Leu Val Phe Asn Asp Phe Val Arg Asn Ala Ser Ser
260 265 270

Ile Asp Glu Thr Ala Lys Glu Lys Leu Ala Pro Phe Ser Asn Leu Ser
275 280 285

Gly Asp Glu Ser Tyr Gln Asn Arg Asp Leu Glu Lys Val Ser Gln Gln
290 295 300

Val Ala Lys Pro Leu Tyr Asp Ala Lys Val Lys Pro Thr Thr Leu Ile
305 310 315 320

Pro Lys Gln Val Gly Asn Met Tyr Thr Ala Ser Leu Tyr Ala Ala Phe
325 330 335

Ala Ser Leu Leu His Ser Lys His Thr Glu Leu Ala Gly Lys Arg Val
340 345 350

Thr Leu Phe Ser Tyr Gly Ser Gly Leu Thr Ala Thr Met Phe Ser Leu
355 360 365

Arg Leu His Glu Gly Gln His Pro Phe Ser Leu Ser Asn Ile Ala Ser
370 375 380

Val Met Asn Val Ala Gly Lys Leu Lys Ala Arg His Glu Leu Pro Pro
385 390 395 400

Glu Lys Phe Val Asp Ile Met Lys Leu Met Glu His Arg Tyr Gly Ala
405 410 415

Lys Asp Phe Val Thr Ser Lys Asp Cys Ser Leu Leu Ala Ser Gly Thr
420 425 430

Tyr Tyr Leu Thr Glu Val Asp Ser Leu Tyr Arg Arg Phe Tyr Ala Gln
435 440 445

Lys Ala Val Gly Asn Thr Val Glu Asn Gly Leu Leu Ala Asn Gly His
450 455 460

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<211> 575

<212> PRT

<213> Hevea brasiliensis

<400> 10

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Pro Leu Tyr Leu Thr Asn Ala Val Phe Phe Thr Leu Phe Phe Ser Val
35 40 45

Ala Tyr Tyr Leu Leu His Arg Trp Arg Asp Lys Ile Arg Asn Ser Thr
50 55 60

Pro Leu His Ile Val Thr Leu Ser Glu Ile Val Ala Ile Val Ser Leu
65 70 75 80

Ile Ala Ser Phe Ile Tyr Leu Leu Gly Phe Phe Gly Ile Asp Phe Val
85 90 95

Gln Ser Phe Ile Ala Arg Ala Ser His Asp Val Trp Asp Leu Glu Asp
100 105 110

Thr Asp Pro Asn Tyr Leu Ile Asp Glu Asp His Arg Leu Val Thr Cys
115 120 125

Pro Pro Ala Asn Ile Ser Thr Lys Thr Thr Ile Ile Ala Ala Pro Thr
130 135 140

Lys Leu Pro Thr Ser Glu Pro Leu Ile Ala Pro Leu Val Ser Glu Glu
145 150 155 160

Asp Glu Met Ile Val Asn Ser Val Val Asp Gly Lys Ile Pro Ser Tyr
165 170 175

Ser Leu Glu Ser Lys Leu Gly Asp Cys Lys Arg Ala Ala Ala Ile Arg
180 185 190

Arg Glu Ala Leu Gln Arg Met Thr Arg Arg Ser Leu Glu Gly Leu Pro
195 200 205

Val Glu Gly Phe Asp Tyr Glu Ser Ile Leu Gly Gln Cys Cys Glu Met
210 215 220

Pro Val Gly Tyr Val Gln Ile Pro Val Gly Ile Ala Gly Pro Leu Leu
225 230 235 240

Leu Asn Gly Arg Glu Tyr Ser Val Pro Met Ala Thr Thr Glu Gly Cys
245 250 255

Leu Val Ala Ser Thr Asn Arg Gly Cys Lys Ala Ile Tyr Leu Ser Gly
260 265 270

Gly Ala Thr Ser Val Leu Leu Lys Asp Gly Met Thr Arg Ala Pro Val
275 280 285

Val Arg Phe Ala Ser Ala Thr Arg Ala Ala Glu Leu Lys Phe Phe Leu
290 295 300

Glu Asp Pro Asp Asn Phe Asp Thr Leu Ala Val Val Phe Asn Lys Ser
305 310 315 320

Ser Arg Phe Ala Arg Leu Gln Gly Ile Lys Cys Ser Ile Ala Gly Lys
325 330 335

Asn Leu Tyr Ile Arg Phe Ser Cys Ser Thr Gly Asp Ala Met Gly Met
340 345 350

Asn Met Val Ser Lys Gly Val Gln Asn Val Leu Glu Phe Leu Gln Ser
355 360 365

Asp Phe Ser Asp Met Asp Val Ile Gly Ile Ser Gly Asn Phe Cys Ser
370 375 380

Asp Lys Lys Pro Ala Ala Val Asn Trp Ile Glu Gly Arg Gly Lys Ser
385 390 395 400

Val Val Cys Glu Ala Ile Ile Lys Glu Glu Val Val Lys Lys Val Leu
405 410 415

Lys Thr Asn Val Ala Ser Leu Val Glu Leu Asn Met Leu Lys Asn Leu
420 425 430

Ala Gly Ser Ala Val Ala Gly Ala Leu Gly Gly Phe Asn Ala His Ala
435 440 445

Gly Asn Ile Val Ser Ala Ile Phe Ile Ala Thr Gly Gln Asp Pro Ala
450 455 460

Gln Asn Val Glu Ser Ser His Cys Ile Thr Met Met Glu Ala Val Asn
465 470 475 480

Asp Gly Lys Asp Leu His Ile Ser Val Thr Met Pro Ser Ile Glu Val
485 490 495

Gly Thr Val Gly Gly Gly Thr Gln Leu Ala Ser Gln Ser Ala Cys Leu
500 505 510

Asn Leu Leu Gly Val Lys Gly Ala Asn Lys Glu Ser Pro Gly Ser Asn
515 520 525

Ser Arg Leu Leu Ala Ala Ile Val Ala Gly Ser Val Leu Ala Gly Glu
530 535 540

Leu Ser Leu Met Ser Ala Ile Ala Ala Gly Gln Leu Val Lys Ser His
545 550 555 560

Met Lys Tyr Asn Arg Ser Ser Lys Asp Met Ser Lys Ala Ala Ser
565 570 575

<210> 11

<211> 386

<212> PRT

<213> Hevea brasiliensis

<400> 11

Met Glu Val Lys Ala Arg Ala Pro Gly Lys Ile Ile Leu Ser Gly Glu
1 5 10 15

His Ala Val Val His Gly Ser Thr Ala Val Ala Ala Ser Ile Asn Leu
20 25 30

Tyr Thr Tyr Val Thr Leu Ser Phe Ala Thr Ala Glu Asn Asp Asp Ser
35 40 45

Leu Lys Leu Gln Leu Lys Asp Leu Ala Leu Glu Phe Ser Trp Pro Ile
50 55 60

Gly Arg Ile Arg Glu Ala Leu Ser Asn Leu Gly Ala Pro Ser Ser Ser
65 70 75 80

Thr Arg Thr Ser Cys Ser Met Glu Ser Ile Lys Thr Ile Ser Ala Leu
85 90 95

Val Glu Glu Glu Asn Ile Pro Glu Ala Lys Ile Ala Leu Thr Ser Gly
100 105 110

Val Ser Ala Phe Leu Trp Leu Tyr Thr Ser Ile Gln Gly Phe Lys Pro
115 120 125

Ala Thr Val Val Val Thr Ser Asp Leu Pro Leu Gly Ser Gly Leu Gly
130 135 140

Ser Ser Ala Ala Phe Cys Val Ala Leu Ser Ala Ala Leu Leu Ala Phe
145 150 155 160

Ser Asp Ser Val Asn Val Asp Thr Lys His Leu Gly Trp Ser Ile Phe
165 170 175

Gly Glu Ser Asp Leu Glu Leu Leu Asn Lys Trp Ala Leu Glu Gly Glu
180 185 190

Lys Ile Ile His Gly Lys Pro Ser Gly Ile Asp Asn Thr Val Ser Ala
195 200 205

Tyr Gly Asn Met Ile Lys Phe Lys Ser Gly Asn Leu Thr Arg Ile Lys
210 215 220

Ser Asn Met Pro Leu Lys Met Leu Val Thr Asn Thr Arg Val Gly Arg
225 230 235 240

Asn Thr Lys Ala Leu Val Ala Gly Val Ser Glu Arg Thr Leu Arg His
245 250 255

Pro Asn Ala Met Ser Phe Val Phe Asn Ala Val Asp Ser Ile Ser Asn
260 265 270

Glu Leu Ala Asn Ile Ile Gln Ser Pro Ala Pro Asp Asp Val Ser Ile
275 280 285

Thr Glu Lys Glu Glu Lys Leu Glu Glu Leu Met Glu Met Asn Gln Gly
290 295 300

Leu Leu Gln Cys Met Gly Val Ser His Ala Ser Ile Glu Thr Val Leu
305 310 315 320

Arg Thr Thr Leu Lys Tyr Lys Leu Ala Ser Lys Leu Thr Gly Ala Gly
325 330 335

Gly Gly Gly Cys Val Leu Thr Leu Leu Pro Thr Leu Leu Ser Gly Thr
340 345 350

Val Val Asp Lys Ala Ile Ala Glu Leu Glu Ser Cys Gly Phe Gln Cys
355 360 365

Leu Ile Ala Gly Ile Gly Gly Asn Gly Val Glu Phe Cys Phe Gly Gly
370 375 380

Ser Ser
385

<210> 12

<211> 503

<212> PRT

<213> Hevea brasiliensis

<400> 12

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Met Ala Val Val Ala Ser Ala Pro Gly Lys Val Leu Met Thr Gly Gly
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Tyr Leu Ile Leu Glu Arg Pro Asn Ala Gly Ile Val Leu Ser Thr Asn
            20                  25                  30

Ala Arg Phe Tyr Ala Ile Val Lys Pro Ile Tyr Asp Glu Ile Lys Pro
        35                  40                  45

Asp Ser Trp Ala Trp Ala Trp Thr Asp Val Lys Leu Thr Ser Pro Gln
    50                  55                  60

Leu Ala Arg Glu Ser Leu Tyr Lys Leu Ser Leu Lys Asn Leu Ala Leu
65                  70                  75                  80

Gln Cys Val Ser Ser Ser Ala Ser Arg Asn Pro Phe Val Glu Gln Ala
                85                  90                  95

Val Gln Phe Ala Val Ala Ala Ala His Ala Thr Leu Asp Lys Asp Lys
            100                 105                 110

Lys Asn Val Leu Asn Lys Leu Leu Leu Gln Gly Leu Asp Ile Thr Ile
        115                 120                 125

Leu Gly Thr Asn Asp Phe Tyr Ser Tyr Arg Asn Glu Ile Glu Ala Cys
    130                 135                 140

Gly Leu Pro Leu Thr Pro Glu Ser Leu Ala Ala Leu Pro Ser Phe Ser
145                 150                 155                 160

Ser Ile Thr Phe Asn Val Glu Glu Ala Asn Gly Gln Asn Cys Lys Pro
                165                 170                 175

Glu Val Ala Lys Thr Gly Leu Gly Ser Ser Ala Ala Met Thr Thr Ala
            180                 185                 190

Val Val Ala Ala Leu Leu His His Leu Gly Leu Val Asp Leu Ser Ser
        195                 200                 205

Ser Cys Lys Glu Lys Lys Phe Ser Asp Leu Asp Leu Val His Ile Ile
    210                 215                 220

Ala Gln Thr Ala His Cys Ile Ala Gln Gly Lys Val Gly Ser Gly Phe
225                 230                 235                 240

Asp Val Ser Ser Ala Val Tyr Gly Ser His Arg Tyr Val Arg Phe Ser
                245                 250                 255

Pro Glu Val Leu Ser Ser Ala Gln Asp Ala Gly Lys Gly Ile Pro Leu
            260                 265                 270
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Gln Glu Val Ile Ser Asn Ile Leu Lys Gly Lys Trp Asp His Glu Arg
275 280 285

Thr Met Phe Ser Leu Pro Pro Leu Met Ser Leu Leu Leu Gly Glu Pro
290 295 300

Gly Thr Gly Gly Ser Ser Thr Pro Ser Met Val Gly Ala Leu Lys Lys
305 310 315 320

Trp Gln Lys Ser Asp Thr Gln Lys Ser Gln Glu Thr Trp Arg Lys Leu
325 330 335

Ser Glu Ala Asn Ser Ala Leu Glu Thr Gln Phe Asn Ile Leu Ser Lys
340 345 350

Leu Ala Glu Glu His Trp Asp Ala Tyr Lys Cys Val Ile Asp Ser Cys
355 360 365

Ser Thr Lys Asn Ser Glu Lys Trp Ile Glu Gln Ala Thr Glu Pro Ser
370 375 380

Arg Glu Ala Val Val Lys Ala Leu Leu Gly Ser Arg Asn Ala Met Leu
385 390 395 400

Gln Ile Arg Asn Tyr Met Arg Gln Met Gly Glu Ala Ala Gly Val Pro
405 410 415

Ile Glu Pro Glu Ser Gln Thr Arg Leu Leu Asp Thr Thr Met Asn Met
420 425 430

Asp Gly Val Leu Leu Ala Gly Val Pro Gly Ala Gly Gly Phe Asp Ala
435 440 445

Val Phe Ala Val Thr Leu Gly Asp Ser Gly Thr Asn Val Ala Lys Ala
450 455 460

Trp Ser Ser Leu Asn Val Leu Ala Leu Leu Val Arg Glu Asp Pro Asn
465 470 475 480

Gly Val Leu Leu Glu Ser Gly Asp Pro Arg Thr Lys Glu Ile Thr Thr
485 490 495

Ala Val Phe Ala Val His Ile
500

<210> 13

<211> 415

<212> PRT

<213> Hevea brasiliensis

<400> 13

Met Ala Glu Ser Trp Val Ile Met Val Thr Ala Gln Thr Pro Thr Asn
1 5 10 15

Ile Ala Val Ile Lys Tyr Trp Gly Lys Arg Asp Glu Lys Leu Ile Leu
20 25 30

Pro Val Asn Asp Ser Ile Ser Val Thr Leu Asp Pro Ala His Leu Cys
35 40 45

Thr Thr Thr Thr Val Ala Val Ser Pro Ser Phe Ala Gln Asp Arg Met
50 55 60

Trp Leu Asn Gly Lys Glu Ile Ser Leu Ser Gly Gly Arg Tyr Gln Asn
65 70 75 80

Cys Leu Arg Glu Ile Arg Ala Arg Ala Cys Asp Val Glu Asp Lys Glu
85 90 95

Arg Gly Ile Lys Ile Ser Lys Lys Asp Trp Glu Lys Leu Tyr Val His
100 105 110

Ile Ala Ser Tyr Asn Asn Phe Pro Thr Ala Ala Gly Leu Ala Ser Ser
115 120 125

Ala Ala Gly Phe Ala Cys Leu Val Phe Ala Leu Ala Lys Leu Met Asn
130 135 140

Ala Lys Glu Asp Asn Ser Glu Leu Ser Ala Ile Ala Arg Gln Gly Ser
145 150 155 160

Gly Ser Ala Cys Arg Ser Leu Phe Gly Gly Phe Val Lys Trp Lys Met
165 170 175

Gly Lys Val Glu Asp Gly Ser Asp Ser Leu Ala Val Gln Val Val Asp
180 185 190

Glu Lys His Trp Asp Asp Leu Val Ile Ile Ile Ala Val Val Ser Ser
195 200 205

Arg Gln Lys Glu Thr Ser Ser Thr Thr Gly Met Arg Glu Thr Val Glu
210 215 220

Thr Ser Leu Leu Leu Gln His Arg Ala Lys Glu Ile Val Pro Lys Arg
225 230 235 240

Ile Val Gln Met Glu Glu Ser Ile Lys Asn Arg Asn Phe Ala Ser Phe
245 250 255

Ala His Leu Thr Cys Ala Asp Ser Asn Gln Phe His Ala Val Cys Met
260 265 270

Asp Thr Cys Pro Pro Ile Phe Tyr Met Asn Asp Thr Ser His Arg Ile
275 280 285

Ile Ser Cys Val Glu Lys Trp Asn Arg Ser Val Gly Thr Pro Gln Val
290 295 300

Ala Tyr Thr Phe Asp Ala Gly Pro Asn Ala Val Leu Ile Ala His Asn
305 310 315 320

Arg Lys Ala Ala Ala Gln Leu Leu Gln Lys Leu Leu Phe Tyr Phe Pro
325 330 335

Pro Asn Ser Asp Thr Glu Leu Asn Ser Tyr Val Leu Gly Asp Lys Ser
340 345 350

Ile Leu Lys Asp Ala Gly Ile Glu Asp Leu Lys Asp Val Glu Ala Leu
355 360 365

Pro Pro Pro Pro Glu Ile Lys Asp Ala Pro Arg Tyr Lys Gly Asp Val
370 375 380

Ser Tyr Phe Ile Cys Thr Arg Pro Gly Gln Gly Pro Val Leu Leu Ser
385 390 395 400

Asp Glu Ser Gln Ala Leu Leu Ser Pro Glu Thr Gly Leu Pro Lys
405 410 415

<210> 14

<211> 232

<212> PRT

<213> Hevea brasiliensis

<400> 14

Met Ala Pro Ala Ala Ala Thr Ala Val Ala Ala Glu Ile Lys Pro Arg
1 5 10 15

Asp Val Cys Ile Val Gly Val Ala Arg Thr Pro Met Gly Gly Phe Leu
20 25 30

Gly Ser Leu Cys Thr Leu Ser Ala Thr Lys Leu Gly Ser Ile Ala Ile
35 40 45

Glu Ala Ala Leu Lys Arg Ala Asn Val Asp Pro Ser Leu Val Gln Glu
50 55 60

Val Phe Phe Gly Asn Val Leu Ser Ala Asn Leu Gly Gln Ala Pro Ala
65 70 75 80

Arg Gln Ala Ala Leu Gly Ala Gly Ile Pro Asn Ser Val Val Cys Thr
85 90 95

Thr Val Asn Lys Val Cys Ala Ser Gly Met Lys Ala Thr Met Leu Ala
100 105 110

Ala Gln Ser Ile Gln Leu Gly Ile Asn Asp Val Val Val Ala Gly Gly
115 120 125

Met Glu Ser Met Ser Asn Ala Pro Lys Tyr Leu Ala Glu Ala Arg Lys
130 135 140

Gly Ser Arg Leu Gly His Asp Ser Leu Val Asp Gly Met Leu Lys Asp
145 150 155 160

Gly Leu Trp Asp Val Tyr Asn Asp Val Gly Met Gly Ser Cys Ala Glu
165 170 175

Ile Cys Ala Asp Asn His Ser Ile Thr Arg Glu Asp Gln Asp Lys Phe
180 185 190

Ala Ile His Ser Phe Glu Arg Gly Ile Ala Ala Gln Glu Ser Gly Ala
195 200 205

Phe Ala Trp Glu Ile Val Pro Val Glu Val Ser Lys Gly Gln Gly Gly
210 215 220

Asn Tyr Asp Trp His Val Gly Cys
225 230

<210> 15

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

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<223> primer

<400> 15
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<210> 16

<211> 25

<212> DNA

<213> Artificial Sequence

<400> 16
gcaatgtaac atcagagatt ttgag 25